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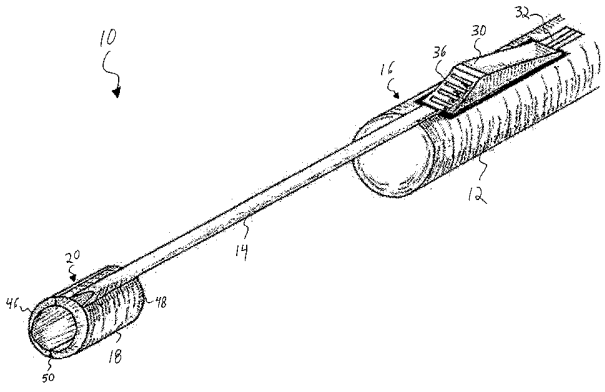
(54) **Title:** TENDON STRIPPER



(57) **Abstract:** The invention includes a tissue eviscerator comprising: (a) a frame including a repositionable cutter to sever bodily tissue; (b) a handle mounted to the frame and operative to reposition the frame with respect to the bodily tissue; and (c) an actuator in communication with the cutter and operative reposition the cutter between a first position and a second position, where movement of the cutter between the first position and the second position is operative to sever the bodily tissue. The invention also includes a method of separating bodily tissue from a bodily substrate, the method comprising: (a) exposing an internal bodily tissue; (b) aligning a tissue eviscerator coaxially along a length of the internal bodily tissue; (c) repositioning the tissue eviscerator along the length of the internal bodily tissue between a first location and a second location, where the act of repositioning of the tissue eviscerator along the length of the internal bodily tissue is operative to separate adjacent bodily tissue from the internal bodily tissue between the first location and the second location; (d) activating a cutter of the tissue eviscerator to sever the internal bodily tissue approximate the second location; and (e) cutting the internal bodily tissue at a location other than the second location to provide a tissue segment.

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PATENT COOPERATION TREATY APPLICATION
Title: TENDON STRIPPER

CROSS REFERENCE TO RELATED APPLICATIONS

[0001] The present application claims the benefit of U.S. Nonprovisional Patent Application Ser. No. 11/121,747, filed May 4, 2005.

RELATED ART

Field of the Invention

[0002] The present invention is directed to orthopedic surgical devices and associated methods of Minimally Invasive Surgery (MIS) and, more specifically, to tendon strippers and associated methods of harvesting tendons for use with MIS.

Brief Discussion of Related Art

[0003] The human body can frequently be impaired through dysfunction of an extremity commonly caused by loss of tendon or ligament function. Although repair of the ligament or tendon can be accomplished if the injury is recognized early, delayed treatment of these types of injuries or conditions may require a tendon transfer.

[0004] Tendon transfer utilizes the power and function of a normal tendon by surgically moving the tendon to another area of the body to substitute or supplement the function of an injured or diseased tendon. The surgical procedure involved with tendon transfer includes exposing both the diseased tendon and the normal tendon, as well as re-routing the origin or insertion of both tendons. A large incision is utilized with this technique to facilitate accurate placement of the transferred tendon. The tendon, once exposed, is transected under clear view of the surgeon and thereafter implanted in the desired location. Implantation may include anchoring the tendon to bone to mimic a new function, or include suturing and weaving the harvested tendon to the diseased tendon to supplement its strength.

[0005] The complications associated with conventional tendon transfer include the rather large surgical incision and resulting exposure. Scarring will frequently occur after surgery in a proportionate amount to the size and length of the incision and exposure. This scarring has been known to limit the function of the newly transferred tendon by adhering to the newly transferred tendon to its surrounding structure.

[0006] An exemplary tendon transfer may involve a torn tendon in the foot. The posterior tibial tendon is a critical tendon structure on the medial (inner border) side of the ankle. The ankle and foot will deviate in an outward direction as the posterior tibial tendon fails to function properly, thereby causing a progressive flatfoot deformity. If the posterior tibial tendon is near failure, the appropriate surgical intervention involves harvesting a neighboring tendon (flexor digitorum longus) and transferring the harvested tendon to the navicular bone to reestablish the normal function of the posterior tibial tendon. Harvesting the flexor digitorum longus tendon (as well as any other harvested tendon) generally requires extensive surgical dissection into the depths of the foot. The most common complication associated with this surgery is not the failure of the transferred tendon, but rather the pain and swelling associated with surgery around the critical veins and nerves in the foot. Thus, there is a need in the relevant art for surgical equipment and associated techniques for reducing the complications associated with tendon harvesting.

SUMMARY

[0007] The present invention is directed to orthopedic surgical devices and associated methods of Minimally Invasive Surgery (MIS) and, more specifically, to tendon strippers and associated methods of harvesting tendons for use with MIS.

[0008] It is a first aspect of the present invention to provide a tendon stripper comprising: (a) a frame, including a cautery, that is adapted to separate surrounding tissue along a length of a tendon; (b) a handle mounted to the frame that is adapted to reposition the frame with respect to the tendon; and (c) an actuator in communication with the cautery and operative to activate the cautery, where activation of the cautery is adapted to sever the tendon.

[0009] In a more detailed embodiment of the first aspect, the frame includes a distal guide adapted to at least partially circumscribe at least a portion of the tendon, where the distal guide is adapted to guide the frame along the length of the tendon. In yet another more detailed embodiment, the cautery includes an electrical cautery wire, the frame includes a housing along which the electrical cautery wire extends, the electrical cautery wire is longitudinally repositionable along a length of the housing, and the electrical cautery wire is mounted to the distal guide to at least partially circumscribe a portion of the tendon in a pre-severance position. In a further detailed embodiment, the electrical cautery wire is mounted to the actuator, and the actuator is operative to reposition the electrical cautery wire between the pre-severance position and a post-severance position, where the repositioning of the electrical cautery wire between the positions includes repositioning the electrical cautery wire along the length of the housing. In still a further detailed embodiment, the distal guide is arcuately shaped, and a distal end of the distal guide is tapered. In a more detailed embodiment, the distal guide includes a cylindrical portion, an aspect of the cylindrical portion is repositionable between an open position and a closed position, where the cylindrical portion circumscribes the tendon in the closed position and the cylindrical portion includes a latch operative to maintain the cylindrical portion in the closed position when engaged and is operative to allow the cylindrical portion to be positioned in the open position when disengaged.

[0010] In yet another more detailed embodiment of the first aspect, the electrical cautery wire is mounted to the cylindrical portion, the electrical cautery wire at least partially circumferentially lines a portion of an interior wall of the cylindrical portion in a U-shaped pre-severance position, and the electrical cautery wire is displaced from the U-shaped pre-severance position to a more taught post-severance position in order to sever the tendon. In still another more detailed embodiment, the handle includes a cavity adapted to house a portable power source, and the handle includes electrical leads adapted to be in electrical communication with the portable power source and the cautery. In a further detailed embodiment, the actuator is repositionably mounted to the handle, the cautery includes an electrical cautery wire, and the actuator is mounted to the electrical cautery wire so that movement of the actuator from a first position to a second position is operative to reposition the electrical cautery wire from

a pre-severance position with respect to the tendon to a post-severance position with respect to the tendon.

[0011] It is a second aspect of the present invention to provide a method of stripping a tendon comprising: (a) exposing a tendon; (b) aligning a tendon stripper guide with respect to a first location to the tendon; (c) repositioning the tendon stripper guide along the tendon from the first location of the tendon to a second location of the tendon, where the act of repositioning of the tendon stripper guide is operative to separate surrounding tissue from the tendon between the first location and the second location; (d) activating a cautery to sever the tendon approximate the second location; and (e) cutting the tendon at a location other than the second location to provide a tendon segment.

[0012] In a more detailed embodiment of the second aspect, the act of aligning the tendon stripper guide includes opening the tendon stripper guide to allow insertion of the tendon and thereafter closing the tendon stripper guide to circumscribe the tendon to inhibit egress of the tendon in a radial direction. In yet another more detailed embodiment, the act of aligning the tendon stripper guide includes aligning the tendon stripper guide with respect to a tendon connected to bodily tissue at each end. In a further detailed embodiment, the act of aligning the tendon stripper guide includes providing a direct line of sight to the first location, and the act of repositioning the tendon stripper guide along the tendon includes discontinuing the direct line of sight prior to reaching the second location. In still a further detailed embodiment, the act of aligning the tendon stripper guide includes providing a direct line of sight to the first location, and the act of repositioning the tendon stripper guide along the tendon includes discontinuing the direct line of sight prior to reaching the second location. In a more detailed embodiment, the act of activating the cautery includes repositioning an actuator to provide electrical communication with a power source to energize the cautery.

[0013] In yet another more detailed embodiment of the second aspect, the cautery includes an electrical wire cautery, the electrical wire cautery is operatively coupled to the actuator, and the act of repositioning the actuator is operative to reposition the

electrical wire cautery from a pre-severance position to a post-severance position. In still another more detailed embodiment, the cautery is mounted to an interior surface of the tendon stripper guide that at least partially circumscribes the tendon, and the tendon stripper guide is operative to inhibit destruction of the surrounding tissue when the cautery is activated.

[0014] It is a third aspect of the present invention to provide a method of stripping a tendon comprising: (a) exposing a tendon; (b) aligning a tendon stripper guide with respect to a first location to the tendon; (c) repositioning the tendon stripper guide along the tendon from the first location of the tendon to a second location of the tendon, where the act of repositioning of the tendon stripper guide is operative to separate surrounding tissue from the tendon between the first location and the second location; (d) tensioning a cutting wire to sever the tendon approximate the second location; and (e) cutting the tendon at a location other than the second location to provide a tendon segment.

[0015] It is a fourth aspect of the present invention to provide a tissue eviscerator comprising: (a) a frame including a repositionable cutter to sever bodily tissue; (b) a handle mounted to the frame and operative to reposition the frame with respect to the bodily tissue; and (c) an actuator in communication with the cutter and operative reposition the cutter between a first position and a second position, where movement of the cutter between the first position and the second position is operative to sever the bodily tissue.

[0016] In a more detailed embodiment of the fourth aspect, the frame further includes a tissue separator for dividing the bodily tissue from an adjacent bodily structure, the tissue separator including a distal guide for circumscribing the bodily tissue and guiding the frame along a length of the bodily tissue. In yet another more detailed embodiment, the cutter comprises a razor cutter, and the frame includes a conduit through which a link runs between the razor cutter and the actuator to operatively couple the actuator to the razor cutter. In a further detailed embodiment, the cutter comprises laser cutter, and the frame includes a conduit through which a link runs between the laser cutter and the actuator to operatively couple the actuator to the laser

cutter. In still a further detailed embodiment, the cutter comprises radio frequency cutter, and the frame includes a conduit through which a link runs between the radio frequency cutter and the actuator to operatively couple the actuator to the radio frequency cutter. In a more detailed embodiment, the cutter comprises ultraviolet radiation cutter, and the frame includes a conduit through which a link runs between the ultraviolet radiation cutter and the actuator to operatively couple the actuator to the ultraviolet radiation cutter.

[0017] In yet another more detailed embodiment of the fourth aspect, the cutter comprises infrared radiation cutter, and the frame includes a conduit through which a link runs between the infrared radiation cutter and the actuator to operatively couple the actuator to the infrared radiation cutter. In still another more detailed embodiment, the cutter comprises thermal cutter, and the frame includes a conduit through which a link runs between the thermal cutter and the actuator to operatively couple the actuator to the thermal cutter. In a further detailed embodiment, the thermal cutter includes an electrical cautery wire, the electrical cautery wire is adapted to be longitudinally repositionable along a length of the conduit, the frame further includes a tissue separator for dividing the bodily tissue from an adjacent bodily structure, the tissue separator including a distal guide for circumscribing the bodily tissue and guiding the frame along a length of the bodily tissue, and the electrical cautery wire is mounted to the distal guide to at least partially circumscribe the bodily tissue in the first position.

[0018] In yet another more detailed embodiment of the fourth aspect, the distal guide is beveled at the distal end, and the distal guide is circular in cross-section along its longitudinal axis. In still another more detailed embodiment, the distal guide includes a cylindrical portion, an aspect of the cylindrical portion is repositionable between an open position and a closed position, where the cylindrical portion circumscribes the bodily tissue in the closed position, and the cylindrical portion includes a latch operative to maintain the cylindrical portion in the closed position when the latch is engaged, and operative to allow the cylindrical portion to be positioned in the open position when the latch is disengaged. In a further detailed embodiment, the repositionable cutter is mounted to the cylindrical portion, and the repositionable

cutter at least partially circumferentially lines a portion of an interior wall of the cylindrical portion in the first position. In still a further detailed embodiment, the handle includes a cavity adapted to house a portable power source, and the handle includes electrical leads adapted to be in electrical communication with the portable power source and the repositionable cutter.

[0019] It is a fifth aspect of the present invention to provide a method of separating bodily tissue from a bodily substrate, the method comprising: (a) exposing an internal bodily tissue; (b) aligning a tissue eviscerator coaxially along a length of the internal bodily tissue; (c) repositioning the tissue eviscerator along the length of the internal bodily tissue between a first location and a second location, where the act of repositioning of the tissue eviscerator along the length of the internal bodily tissue is operative to separate adjacent bodily tissue from the internal bodily tissue between the first location and the second location; (d) activating a cutter of the tissue eviscerator to sever the internal bodily tissue approximate the second location; and (e) cutting the internal bodily tissue at a location other than the second location to provide a tissue segment.

[0020] In a more detailed embodiment of the fifth aspect, the act of aligning the tissue eviscerator includes opening the tissue eviscerator to allow insertion of the internal bodily tissue and thereafter closing the tissue eviscerator to circumscribe the internal bodily tissue to inhibit egress of the internal bodily tissue in a radial direction. In yet another more detailed embodiment, the act of aligning the tissue eviscerator includes aligning the tissue eviscerator with respect to internal bodily tissue connected to a bodily structure at opposing ends of the internal bodily tissue. In a further detailed embodiment, the act of aligning the tissue eviscerator includes providing a direct line of sight to the first location, and the act of repositioning the tissue eviscerator along the length of the internal bodily tissue includes discontinuing the direct line of sight prior to reaching the second location. In still a further detailed embodiment, the act of activating the cutter includes repositioning an actuator, coupled to the cutter, between a pre-severance position and a post-severance position. In a more detailed embodiment, the cutter comprises an electrical wire cautery, the electrical wire cautery is mounted to an interior surface of the tissue eviscerator that at least partially

circumscribes the interior bodily tissue, and the tissue eviscerator is operative to inhibit destruction of the surrounding tissue when the electrical wire cautery is activated.

[0021] It is a sixth aspect of the present invention to provide a method of stripping a tendon comprising: (a) exposing an internal bodily tissue; (b) aligning a tissue eviscerator with respect to a first location of the internal bodily tissue; (c) repositioning the tissue eviscerator along a length of the internal bodily tissue from the first location to a second location of the tendon, where the act of repositioning of the tendon stripper guide is operative to separate surrounding tissue from the internal bodily tissue between the first location and the second location; (d) tensioning a cutter to sever the internal bodily tissue approximate the second location; and (e) cutting the internal bodily tissue at a location other than the second location to provide an internal bodily tissue segment.

[0022] The aforementioned aspects should not be considered a completely inclusive summary of the present invention. Reference is had to the Detailed Description for a more accurate and inclusive understanding of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0023] FIG. 1 is an overhead view of a first exemplary embodiment of the present invention;

[0024] FIG. 2 is a left side perspective view of the first exemplary embodiment of FIG. 1, shown with a cut-away view of the exemplary handle;

[0025] FIG. 3 is a frontal elevated perspective view of the first exemplary embodiment of FIG. 1;

[0026] FIG. 4 is an elevated perspective view of the exemplary barrel of the first exemplary embodiment of FIG. 1, shown in the open position;

[0027] FIG. 5 is a cross-sectional view of the exemplary barrel of FIG. 4 in the closed position, where the cautery wire is shown in the pre-severance position; and

[0028] FIG. 6 is a cross-sectional view of the exemplary barrel of FIG. 4 in the closed position, where the cautery wire is shown in the post-severance position.

DETAILED DESCRIPTION

[0029] The exemplary embodiments of the present invention are described and illustrated below to encompass orthopedic surgical devices and associated techniques that are applicable in areas such as, without limitation, tendon harvesting and Minimally Invasive Surgery (MIS). Of course, it will be apparent to those of ordinary skill in the art that the preferred embodiments discussed below are exemplary in nature and may be reconfigured without departing from the scope and spirit of the present invention. However, for clarity and precision, the exemplary embodiments as discussed below may include optional steps, methods, and features that one of ordinary skill should recognize as not being a requisite to fall within the scope of the present invention.

[0030] Referencing FIGS. 1-3, a first exemplary tendon stripper 10 includes a handle 12 mounted to a semiflexible plastic connecting rod 14 at a proximal end 16. The connecting rod 14 extends outward from the handle 12 and is mounted to a plastic barrel 18 at a distal end 20. The handle 12 includes a cavity 22 adapted to house a portable power source 24 such as, without limitation, batteries. Electrical leads 26 housed within the cavity 22 provide electrical communication between one of a set of contact plates (not shown) and the batteries 24, while a second contact plate is in electrical communication with an electrically powered cautery 28. For purposes of explanation only, the electrically powered cautery 28 of the first exemplary embodiment is described as an electrical monofilament wire cautery. Those of ordinary skill will readily understand that other cautery devices may be used in lieu of or in addition to the electrical monofilament wire cautery 28 such as, without limitation, monopolar/bipolar cautery, radiofrequency probe, optical filament, or laser energy.

[0031] In exemplary form, the handle 12 of the stripper 10 is intended to be seated within the palm of the user's hand, with the user's finger wrapping around the handle 12 and the user's thumb facing the barrel 18. An actuator 30 repositionably mounted to the handle 12 is intended to be engaged by a user's thumb in order to reposition the actuator and activate the electrical wire cautery 28. The actuator 30 rides within a channel 32 formed within the surface of the handle 12 that provides linear travel forward and rearward (as shown by the arrow of FIG. 2). A forward depression 34 within the actuator 30 includes a plurality of horizontal plateaus 36 that are adapted provide a gripping surface for user's thumb to engage while moving the actuator rearward. In addition, the actuator 30 includes a second, rearward depression 38 adapted to receive a user's thumb when moving the actuator 30 forward.

[0032] The underside of the actuator 30 includes a corresponding set of contact plates (not shown) that provide electrical communication between the batteries 24 and the electrical wire cautery 28 after the actuator is moved rearward beyond a predetermined point. Those of ordinary skill will realize that the precise point at which the contact plates close the circuit to provide electric current to the cautery 28 is within the purview of one of ordinary skill and may be changed without departing from the scope and spirit of the present invention. Likewise, it is within the scope of the invention to provide a separate actuator (other than the actuator 30 mounted to the electrical wire cautery 28) that is responsible for establishing electrical communication between the cautery 28 and batteries 24.

[0033] A frontal aspect 40 of the actuator 30 is coupled to the electrical wire cautery 28, which extends through a cylindrical conduit 42 extending substantially the entire length of the connecting rod 14. The electrical wire cautery 28 exits the distal end of the connecting rod 14 through a hole 44 connecting the interior of the conduit 42 with the interior of the barrel 18.

[0034] Referring to FIG. 4, the barrel 18 includes a first semiannular section 46 that is repositionable with respect to a second semiannular section 48 by way of a hinge 50 and catch 52. The hinge 50 may be a living hinge or mechanical hinge operative to

allow an opening 54 between the sections 46, 48 to accommodate a linear section of a tendon to be lowered into the interior of the barrel 18. It is to be understood that the hinged barrel 18 of the first exemplary tendon stripper 10 accommodates tendons that are either detached from bodily tissue at one or both ends, as well as tendons attached to bodily tissue at opposing ends. Exemplary manually operative catches or fasteners 52 may be snap-fit or any other type of catch/fastener that provides for selective opening and closing of the sections 46, 48. It is also within the scope of the invention that the catch be automatically operated.

[0035] In the closed position, the sections 46, 48 provide a cylindrical barrel 18 that includes a circular cross-section. Nevertheless, it is to be understood that the dimensions and contours of the barrel 18 are exemplary in nature and may be reconfigured to include, without limitation, rectangular cross-sections and oblong circular cross-sections. As will be discussed in more detail below, the distal end 20 of each of the sections 46, 48 and the distal end 20 of the connecting rod 14 are beveled to decrease the resistance to longitudinal movement of the barrel 18 in the proximal direction (or distal direction with respect to the stripper 10 itself) to strip the tissue surrounding the tendon as the barrel 18 progresses along the length of the tendon.

[0036] Referring to FIGS. 4-6, the electrical wire cautery 28 is anchored within a cavern 58 of the first semiannular section 46. The portion of the electrical wire cautery 28 extending beyond the cavern 58 and within the barrel 18 is seated within a circumferential recess 60 on the interior of the barrel 18 (extending along the two semiannular interior surfaces of the sections 46, 48) until reaching the hole 44 leading out of the barrel 18 in the "slacked position." This slacked position (see FIGS. 3 and 4) corresponds with the position of the actuator 30 in the most forward position or in pre-severance position where the electrical wire cautery 28 at least partially circumscribes the tendon to accommodate the shape of the tendon. In contrast, when the actuator 30 is repositioned rearward (see FIG. 2), the rearward action of the actuator 30 pulls on the wire cautery 28 within the connecting rod 14 thereby withdrawing the wire from within the barrel 18 until the length of the electrical wire cautery 28 within the barrel 18 is substantially decreased resulting in a "taught position" or post-severance position (see FIG. 6). A return wire 62, in electrical

communication with anchored aspect of the wire cautery 28, runs parallel to the cautery wire in a separate recess 64 within the interior of the barrel 18. The return wire 62 exits the barrel 18 through the hole 44 and extends through the cylindrical conduit 42 of the connecting rod 14 until reaching the interior of the handle 12 and into electrical communication with one of the electrical contact plates to close the circuit. As discussed above, when the actuator 30 is repositioned rearward to a predetermined position to allow for contact between the electrical contact plates, the electrical circuit is closed and the electrical wire cautery 28 is energized resulting in the wire becoming heated to a sufficient degree to burn through the tendon within the barrel 18.

[0037] The stripper 10 is manufactured in variable sizes to precisely allow various diameters and lengths of tendons to be harvested, such as by adjusting the diameter of the barrel 18 and the length of the connecting rod 14. By matching the diameter of the barrel 18 to the prospective tendon to be harvested, the surrounding soft tissue is protected from inadvertent entry. Exemplary measurements for components of the tendon stripper 10 include an overall length of 40 centimeters and a handle 12 having a length of 15 centimeters and a diameter of 2 millimeters. The barrel 18 includes a length of approximately 1.5 centimeters and a diameter ranging between approximately 4.0 millimeters to about 9.0 millimeters.

[0038] Exemplary components used to construct the exemplary stripper 10 include electrical wire cauteries 28 commercially available from Malin Company, Inc., 5400 Smith Road, Cleveland, OH 44142, and connecting rods 14 commercially available from The MedTech Group, Inc., 6 Century Road, South Plainfield, NJ 07080. Other components such as the barrel 18, handle 12, and actuator 30 may be fabricated from various plastics using exemplary processes such as injection molding.

[0039] The electrical wire cautery 28 of the present invention may comprise at least two aspects. A first aspect of the wire cautery 28, positioned within the barrel 18 as shown in FIGS. 4 and 5, may be comprised of a high resistance filament, whereas a second aspect comprising the remainder of the wire cautery 28 may be comprised of a

low resistance wire. The lengths of the first and second aspects of the electrical wire cautery 28 are well within the purview of one of ordinary skill.

[0040] The exemplary tendon stripper 10 may be utilized for accurate and atraumatic harvesting of a tendon connected to tissue at opposing ends, without requiring severance of the tendon at a distal end prior to severance of the tendon at a proximal end using the stripper. A small 3 centimeter incision is made to expose a subcutaneous portion of a tendon. The catch 52 is released to allow the semiannular sections 46, 48 of the barrel 18 to be separated via movement of the hinge 50 to create the opening 54 through which the viewed tendon is longitudinally repositioned to pass through and lie on the interior of the barrel 18. After the tendon is located in the interior of the barrel 18, the sections 46, 48 are brought together to close the opening 54 and the catch 52 is secured.

[0041] The barrel 18 is advanced within the tissue plane of the tendon until reaching a predetermined location, while concurrently avoiding exposure of companion neurovascular structures. Movement of the barrel 18 along the tendon is operative to separate the tendon from surrounding bodily tissue. Once the barrel 18 is advanced to a predetermined location along of the tendon, the actuator 30 is repositioned rearward away from the barrel 18 to provide contact between the contact plates to close the circuit and energize the electrical wire cautery 28 positioned underneath of the tendon. As the actuator 30 continues to be moved rearward, portions of the electrical wire cautery 28 are withdrawn from the barrel 18 through the hole 44, thereby reducing the length of the electrical wire cautery 28 remaining within the barrel 18. The tendon in the path of the moving electrical wire cautery 28, while energized, is cauterized. Eventually, enough of the electrical wire cautery 28 is withdrawn from the barrel 18 to arrive at the taught position shown in FIG. 6 coinciding with any tendon within the barrel 18 being completely severed by the action of the electrical wire cautery 28. The severed tendon is pulled away from the barrel 18 and delivered to the incision. The actuator 22 is pushed to an off position and the stripper 10 is withdrawn.

[0042] The exemplary stripper 10 is advantageous in both arthroscopy and MIS applications to minimally disrupt surrounding soft tissue structures. The body responds better to less injury and heals faster as the incision and wound is smaller by using a stripper 10 that does not require line of sight prior to cauterizing the tendon, nor requires that one end of the tendon be free prior to cauterization. Moreover, the surrounding tissue is protected from the heat of the cauterization by the barrel 18 of the tendon stripper 10.

[0043] It is also within the scope of the present invention to exchange the cautery 28 for a razor wire. In this manner, the actuator might be rearwardly repositioned to withdraw a portion of the razor wire from the barrel in a manner that would be operative to sever the tendon. It is also within the scope of the invention to provide a delivery system for optical cable to deliver laser energy or to use the barrel to deliver a probe for radiofrequency energy or monopolar/bipolar electrocautery. It is further within the scope of the invention to utilize a hybrid system that electrifies a razor wire. It should be noted, however, that the exemplary term "wire" does not forestall use of a blade or other device that may not necessarily be shaped in a cylindrical or near cylindrical fashion to sever the tendon.

[0044] As used herein, the term "wire" encompasses any strand, rod or conduit operative to conduct and/or convey at least one of alternating current, direct current, radio frequency signals, ultraviolet radiation, visible radiation, infrared radiation, ultrasonic sound, caustic substances, and low temperature fluids adapted to be utilized to sever tissue.

[0045] While the foregoing embodiment has been described using polymer components, it is also within the scope of the invention to replace some or all of these polymer components with metallic components. For example, the connecting rod 14, the handle 12, and the barrel 18 may be fabricated from stainless steel, titanium, or other appropriate medical grade material. In such an instance, the barrel 18 may be lined with an insulator to ensure proper operation of the cautery.

[0046] While the foregoing embodiment has been described using an on-board power source 24, it is also within the scope of the invention to utilize a corded power source. Moreover, in instances where the cautery is not electrically energized to achieve a cutting action, the corded power source may be exchanged or supplemented by a radio frequency source, an ultraviolet radiation source, a visible radiation source, an infrared radiation source, an ultrasonic sound source, a caustic substance source, and a low temperature fluid source utilized to sever tissue.

[0047] While the foregoing embodiment has been described as a tendon stripper 10, those skilled in the art will readily understand that the aforementioned embodiment may be utilized to separate and cut bodily tissue strands. Examples of such strands include, without limitation, ligaments.

[0048] Following from the above description and invention summaries, it should be apparent to those of ordinary skill in the art that, while the methods and apparatuses herein described constitute exemplary embodiments of the present invention, the invention contained herein is not limited to this precise embodiment and that changes may be made to such embodiments without departing from the scope of the invention as defined by the claims. Additionally, it is to be understood that the invention is defined by the claims and it is not intended that any limitations or elements describing the exemplary embodiments set forth herein are to be incorporated into the interpretation of any claim element unless such limitation or element is explicitly stated. Likewise, it is to be understood that it is not necessary to meet any or all of the identified advantages or objects of the invention disclosed herein in order to fall within the scope of any claims, since the invention is defined by the claims and since inherent and/or unforeseen advantages of the present invention may exist even though they may not have been explicitly discussed herein.

[0049] What is claimed is:

1. A tendon stripper comprising:

a frame, including a cautery, that is adapted to separate surrounding tissue along a length of a tendon;

a handle mounted to the frame that is adapted to reposition the frame with respect to the tendon; and

an actuator in communication with the cautery and operative to activate the cautery, where activation of the cautery is adapted to sever the tendon.

2. The tendon stripper of claim 1, wherein the frame includes a distal guide adapted to at least partially circumscribe at least a portion of the tendon, where the distal guide is adapted to guide the frame along the length of the tendon.

3. The tendon stripper of claim 1, wherein:

the cautery includes an electrical cautery wire;

the frame includes a housing along which the electrical cautery wire extends, the electrical cautery wire is adapted to be longitudinally repositionable along a length of the housing; and

the electrical cautery wire is mounted to the distal guide to at least partially circumscribe a portion of the tendon in a pre-severance position.

4. The tendon stripper of claim 3, wherein:

the electrical cautery wire is mounted to the actuator; and

the actuator is operative to reposition the electrical cautery wire between the pre-severance position and a post-severance position, the repositioning of the electrical cautery wire between the positions includes repositioning the electrical cautery wire along the length of the housing.

5. The tendon stripper of claim 1, wherein:

the distal guide is arcuately shaped; and

a distal end of the distal guide is tapered.

6. The tendon stripper of claim 2, wherein:

the distal guide includes a cylindrical portion;

an aspect of the cylindrical portion is repositionable between an open position and a closed position, where the cylindrical portion circumscribes the tendon in the closed position; and

the cylindrical portion includes a latch operative to maintain the cylindrical portion in the closed position when engaged, and operative to allow the cylindrical portion to be positioned in the open position when disengaged.

7. The tendon stripper of claim 6, wherein:

the electrical cautery wire is mounted to the cylindrical portion;

the electrical cautery wire at least partially circumferentially lines a portion of an interior wall of the cylindrical portion in a U-shaped pre-severance position; and

the electrical cautery wire is displaced from the U-shaped pre-severance position to a more taught post-severance position in order to sever the tendon.

8. The tendon stripper of claim 1, wherein:

the handle includes a cavity adapted to house a portable power source; and

the handle includes electrical leads adapted to be in electrical communication with the portable power source and the cautery.

9. The tendon stripper of claim 1, wherein:

the actuator is repositionably mounted to the handle;

the cautery includes an electrical cautery wire; and

the actuator is mounted to the electrical cautery wire so that movement of the actuator from a first position to a second position is operative to reposition the electrical cautery wire from a pre-severance position with respect to the tendon to a post-severance position with respect to the tendon.

10. A method of stripping a tendon comprising:

exposing a tendon;

aligning a tendon stripper guide with respect to a first location of the tendon;

repositioning the tendon stripper guide along the tendon from the first location of the tendon to a second location of the tendon, where the act of repositioning of the tendon stripper guide is operative to separate surrounding tissue from the tendon between the first location and the second location;

activating a cautery to sever the tendon approximate the second location; and

cutting the tendon at a location other than the second location to provide a tendon segment.

11. The method of claim 10, wherein the act of aligning the tendon stripper guide includes opening the tendon stripper guide to allow insertion of the tendon and thereafter closing the tendon stripper guide to circumscribe the tendon to inhibit egress of the tendon in a radial direction.

12. The method of claim 10, wherein the act of aligning the tendon stripper guide includes aligning the tendon stripper guide with respect to a tendon connected to bodily tissue at each end.

13. The method of claim 10, wherein:

the act of aligning the tendon stripper guide includes providing a direct line of sight to the first location; and

the act of repositioning the tendon stripper guide along the tendon includes discontinuing the direct line of sight prior to reaching the second location.

14. The method of claim 10, wherein the act of activating the cautery includes repositioning an actuator to provide electrical communication with a power source to energize the cautery.

15. The method of claim 14, wherein:

the cautery includes an electrical wire cautery;

the electrical wire cautery is operatively coupled to the actuator; and

the act of repositioning the actuator is operative to reposition the electrical wire cautery from a pre-severance position to a post-severance position.

16. The method of claim 10, wherein:

the cautery is mounted to an interior surface of the tendon stripper guide that at least partially circumscribes the tendon; and

the tendon stripper guide is operative to inhibit destruction of the surrounding tissue when the cautery is activated.

17. A method of stripping a tendon comprising:

exposing a tendon;

aligning a tendon stripper guide with respect to a first location of the tendon;

repositioning the tendon stripper guide along the tendon from the first location of the tendon to a second location of the tendon, where the act of repositioning of the tendon stripper guide is operative to separate surrounding tissue from the tendon between the first location and the second location;

tensioning a cutting wire to sever the tendon approximate the second location; and

cutting the tendon at a location other than the second location to provide a tendon segment.

18. A tissue eviscerator comprising:

a frame including a repositionable cutter to sever bodily tissue;

a handle mounted to the frame and operative to reposition the frame with respect to the bodily tissue; and

an actuator in communication with the cutter and operative reposition the cutter between a first position and a second position, where movement of the cutter between the first position and the second position is operative to sever the bodily tissue.

19. The tissue eviscerator of claim 18, wherein the frame further includes a tissue separator for dividing the bodily tissue from an adjacent bodily structure, the tissue separator including a distal guide for circumscribing the bodily tissue and guiding the frame along a length of the bodily tissue.

20. The tissue eviscerator of claim 18, wherein:

the cutter comprises a razor cutter; and

the frame includes a conduit through which a link runs between the razor cutter and the actuator to operatively couple the actuator to the razor cutter.

21. The tissue eviscerator of claim 18, wherein:

the cutter comprises laser cutter; and

the frame includes a conduit through which a link runs between the laser cutter and the actuator to operatively couple the actuator to the laser cutter.

22. The tissue eviscerator of claim 18, wherein:

the cutter comprises radio frequency cutter; and

the frame includes a conduit through which a link runs between the radio frequency cutter and the actuator to operatively couple the actuator to the radio frequency cutter.

23. The tissue eviscerator of claim 18, wherein:

the cutter comprises ultraviolet radiation cutter; and

the frame includes a conduit through which a link runs between the ultraviolet radiation cutter and the actuator to operatively couple the actuator to the ultraviolet radiation cutter.

24. The tissue eviscerator of claim 18, wherein:

the cutter comprises infrared radiation cutter; and

the frame includes a conduit through which a link runs between the infrared radiation cutter and the actuator to operatively couple the actuator to the infrared radiation cutter.

25. The tissue eviscerator of claim 18, wherein:

the cutter comprises thermal cutter; and

the frame includes a conduit through which a link runs between the thermal cutter and the actuator to operatively couple the actuator to the thermal cutter.

26. The tissue eviscerator of claim 25, wherein:

the thermal cutter includes an electrical cautery wire;

the electrical cautery wire is adapted to be longitudinally repositionable along a length of the conduit;

the frame further includes a tissue separator for dividing the bodily tissue from an adjacent bodily structure, the tissue separator including a distal guide for circumscribing the bodily tissue and guiding the frame along a length of the bodily tissue; and

the electrical cautery wire is mounted to the distal guide to at least partially circumscribe the bodily tissue in the first position.

27. The tissue eviscerator of claim 26, wherein:

the distal guide is beveled at the distal end; and

the distal guide is circular in cross-section along its longitudinal axis.

28. The tissue eviscerator of claim 29, wherein:

the distal guide includes a cylindrical portion;

an aspect of the cylindrical portion is repositionable between an open position and a closed position, where the cylindrical portion circumscribes the bodily tissue in the closed position; and

the cylindrical portion includes a latch operative to maintain the cylindrical portion in the closed position when the latch is engaged, and operative to allow the cylindrical portion to be positioned in the open position when the latch is disengaged.

29. The tissue eviscerator of claim 28, wherein:

the repositionable cutter is mounted to the cylindrical portion; and

the repositionable cutter at least partially circumferentially lines a portion of an interior wall of the cylindrical portion in the first position.

30. The tissue eviscerator of claim 18, wherein:

the handle includes a cavity adapted to house a portable power source; and

the handle includes electrical leads adapted to be in electrical communication with the portable power source and the repositionable cutter.

31. A method of separating bodily tissue from a bodily substrate, the method comprising:

exposing an internal bodily tissue;

aligning a tissue eviscerator coaxially along a length of the internal bodily tissue;

repositioning the tissue eviscerator along the length of the internal bodily tissue between a first location and a second location, where the act of repositioning of the tissue eviscerator along the length of the internal bodily tissue is operative to separate adjacent bodily tissue from the internal bodily tissue between the first location and the second location;

activating a cutter of the tissue eviscerator to sever the internal bodily tissue approximate the second location; and

cutting the internal bodily tissue at a location other than the second location to provide a tissue segment.

32. The method of claim 31, wherein the act of aligning the tissue eviscerator includes opening the tissue eviscerator to allow insertion of the internal bodily tissue and thereafter closing the tissue eviscerator to circumscribe the internal bodily tissue to inhibit egress of the internal bodily tissue in a radial direction.

33. The method of claim 31, wherein the act of aligning the tissue eviscerator includes aligning the tissue eviscerator with respect to internal bodily tissue connected to a bodily structure at opposing ends of the internal bodily tissue.

34. The method of claim 31, wherein:

the act of aligning the tissue eviscerator includes providing a direct line of sight to the first location; and

the act of repositioning the tissue eviscerator along the length of the internal bodily tissue includes discontinuing the direct line of sight prior to reaching the second location.

35. The method of claim 31, wherein the act of activating the cutter includes repositioning an actuator, coupled to the cutter, between a pre-severance position and a post-severance position.

36. The method of claim 35, wherein:

the cutter comprises an electrical wire cautery;

the electrical wire cautery is mounted to an interior surface of the tissue eviscerator that at least partially circumscribes the interior bodily tissue; and

the tissue eviscerator is operative to inhibit destruction of the surrounding tissue when the electrical wire cautery is activated.

37. A method of stripping a tendon comprising:

exposing an internal bodily tissue;

aligning a tissue eviscerator with respect to a first location of the internal bodily tissue;

repositioning the tissue eviscerator along a length of the internal bodily tissue from the first location to a second location of the tendon, where the act of repositioning of the tendon stripper guide is operative to separate surrounding tissue from the internal bodily tissue between the first location and the second location;

tensioning a cutter to sever the internal bodily tissue approximate the second location; and

cutting the internal bodily tissue at a location other than the second location to provide an internal bodily tissue segment.

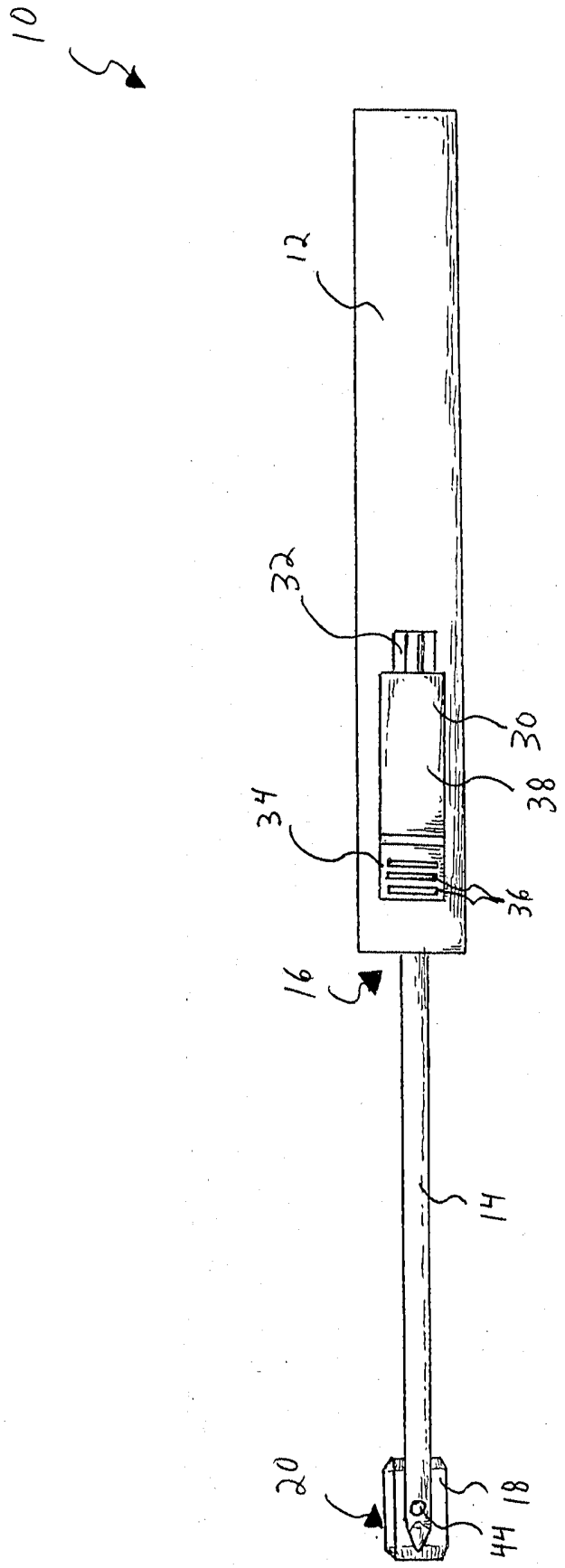
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FIG. 1

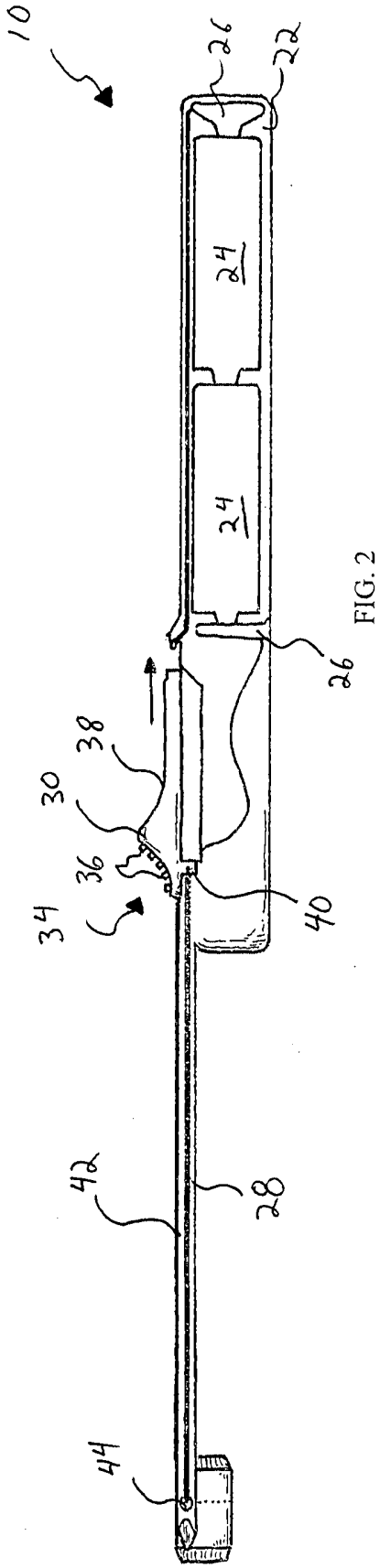
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FIG. 2

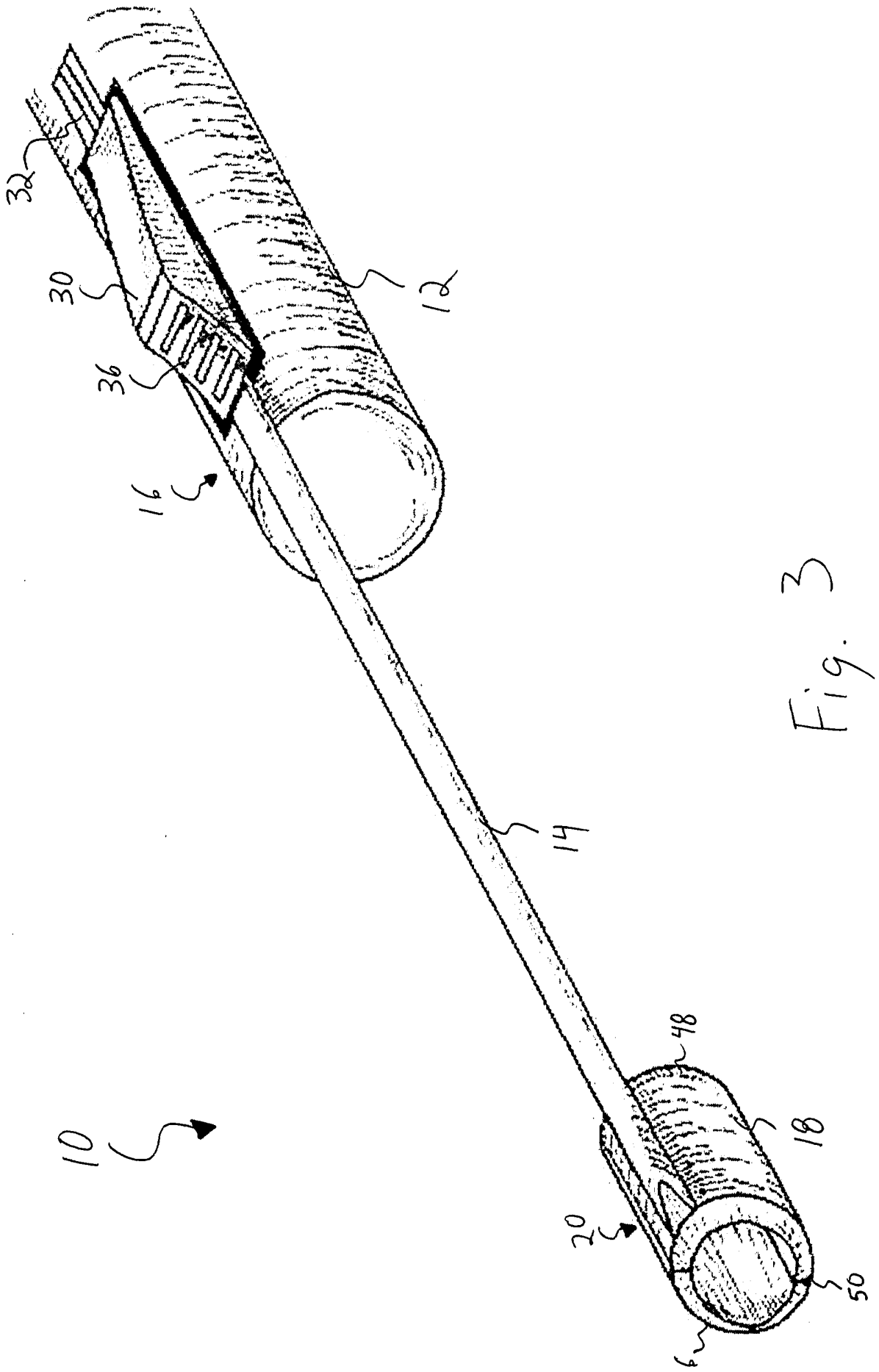

Fig. 3

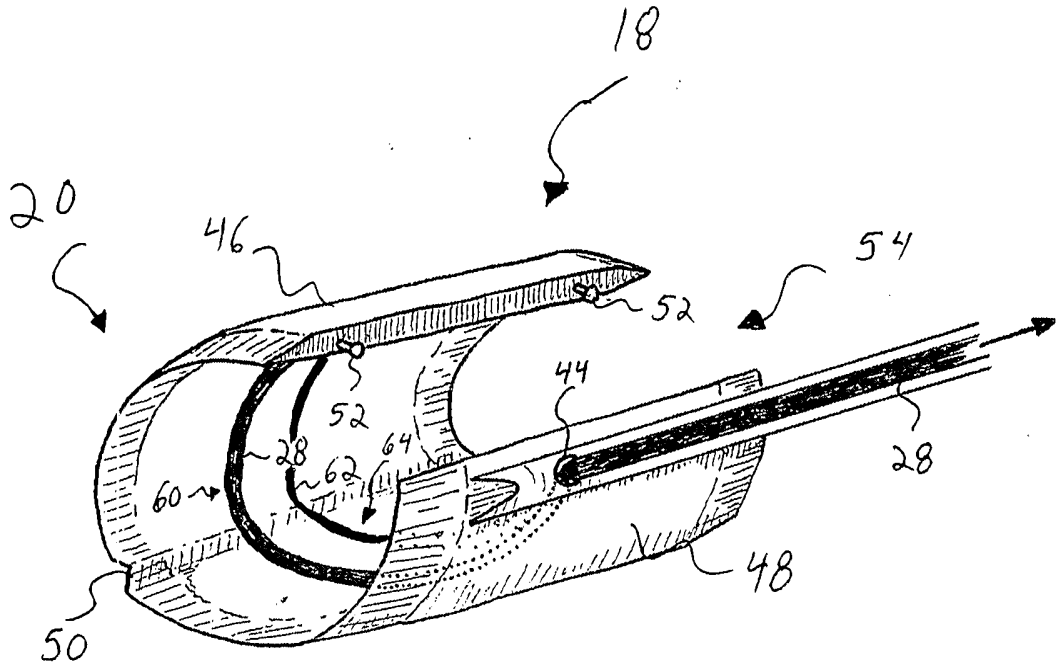

FIG. 4

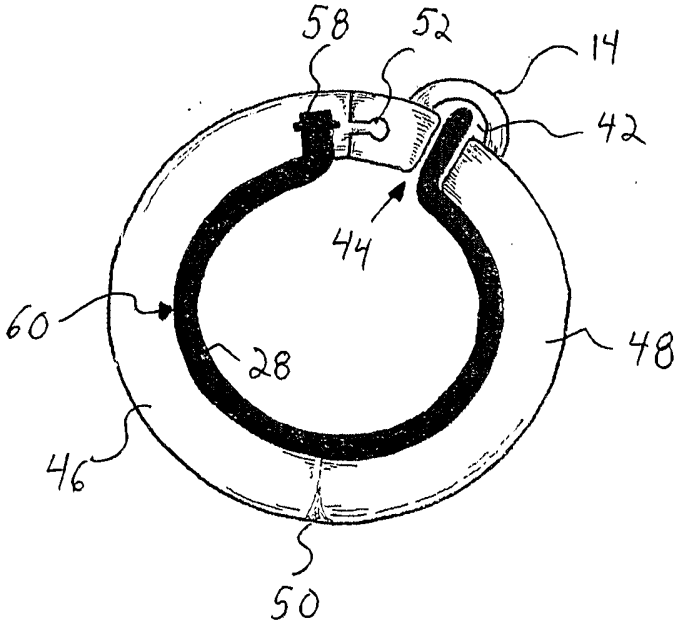

FIG. 5

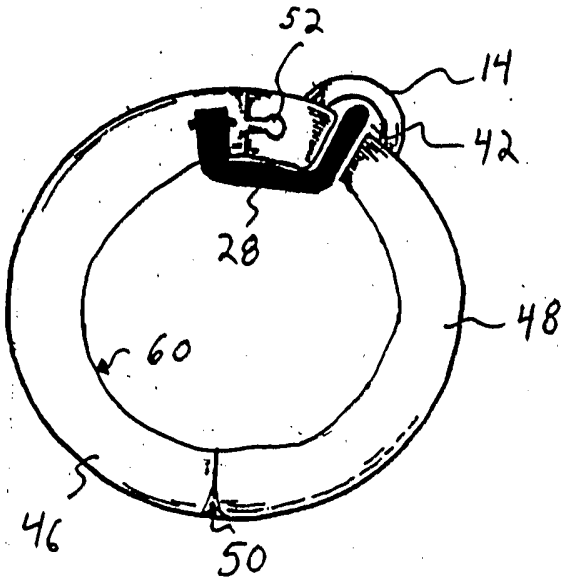

Fig. 6